System Improvement Scheme (SIS)
(R & M and Augmentation)
11TH Five-Year Plan (2007-2012)

The erstwhile GEB was formed in year 1960 and there were three major departments viz. Generation, Transmission and Distribution. The main work of Transmission Department was to erect new substations & lines and to carry out the O & M work of substations and lines. Due to increase in population of substations, lines and also the IE Act 2003, came in force so strengthening of net work is necessary. Further awareness in public has arises for continuous uninterrupted power supply and so to satisfy all these aspect and to fulfill requirement of Act 2003, it was necessary to reform a transmission company.

Now GEB is unbundled into various companies including GETCO. In GETCO network, majority of substations and lines are very old, the equipments in service at various substations are very old & for that either spares are not available or they are of obsolete design. Similarly lines required strengthening to feed continuous power supply or uninterrupted power supply to DISCOMs & our valuable consumers, to stand against the competition between Private sector and GETCO due to open access.

Also demand has increased due to urban population, agricultural and industrial production. The lines and transformers are found overloaded due to old infrastructures and the existing network is not adequate to satisfy the demand. To overcome this, separate Renovation and Modernization (R & M) wing is necessary to prepare proper planning for strengthening the existing net work and to implement modern technology, to give reliable power and to reduce the transmission losses in network.

To carry out the replacement work of equipments or strengthening of lines it is necessary to carry out the same in phased manner. The work requires identifying the age wise equipments, transmission lines having out dated technology etc. The main role of the R&M and planning wing is to carry out the R&M work by proper way i.e. renovation and modernization, augmentation of substation capacity or lines as per requirement, to adopt new technology for the testing of the equipments or to provide new equipment with latest technology.

Mission:

Power Transmission & Distribution is finally getting the attention it deserves. It is now accepted that unless distribution reforms are carried through, the power sector will not become reliable & attractive for investors.

GETCO in its constant endeavour for finding new and innovative ways to improve its services to consumers, plan to put focused efforts on activity catering to needs of Indian power users. The Government has embarked upon a number of structural & operational changes to reform the sector.

In GETCO the Transmission system is very old. Some of the sub-station are more than 40 years old. The numbers of sub-stations age/circle wise are as under:

AGEWISE SUB-STATIONS

Name of Circle	1 to 5	6 to 10	11to 15	16 to 20	21 to 25	26 to 30	31 to 35	36 to 40	Above 41	Total
Navasari	12	12	11	9	7	3	6	4	5	69
Bharuch	4	7	11	7	5	5	2	1	1	43
Jambuva	8	10	15	17	12	5	14	8	2	91
Nadiad	18	12	27	14	9	9	6	7	2	104
Mehsana	22	9	23	15	12	13	7	3	0	104
Palanpur	36	18	30	20	4	7	5	1	0	121
Gondal	21	16	19	10	4	5	3	2	4	84
Junagadh	7	18	17	8	6	4	8	2	1	71
Amreli	16	21	22	11	2	6	3	4	0	85
Anjar	15	13	11	6	2	7	3	0	0	57
Asoj	1	2	1	3	0	0	0	0	0	7
Total	160	138	187	120	63	64	57	32	15	836

The details of existing network of Transmission line in service is as under:

Sr. No.	Voltage Class	Nos. of Feeder	Total Length of Line in KMs.
1	66 KV	993	16369
2	132 KV	137	4550
3	220 KV	206	11334
4	400 KV	14	1842

The equipments in service in many Sub-stations are

(1) Very old.
(2) Obsolete design.
(3) Low rupturing capacity.
(4) Spares not available.
(5) Closer of manufacturing units.

Hence it is necessary to replace these equipments.

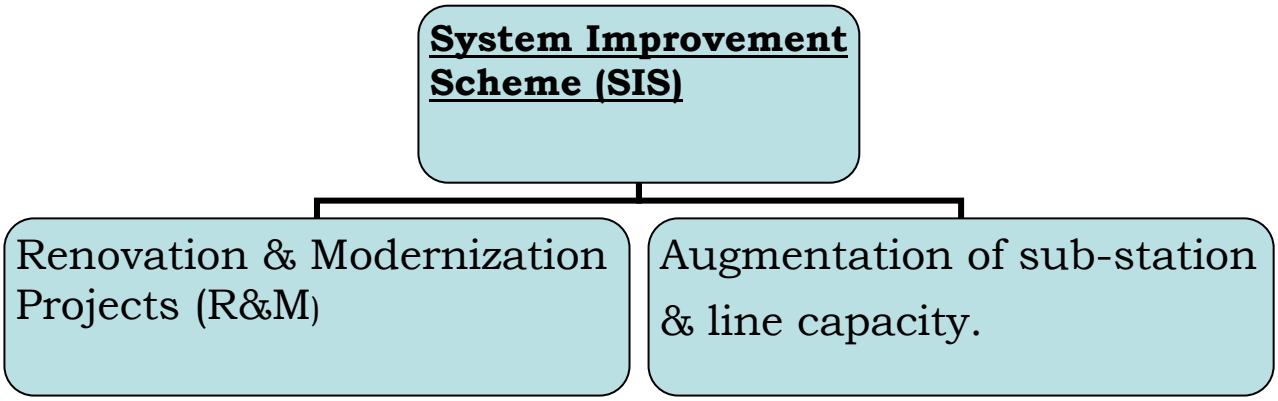
Similarly EHV network / lines are

(1) Very old.
(2) Passing through costal / chemically polluted areas.
(3) Gujarat is having large coastal area; due to saline atmosphere, the line structures/ towers, hardware, conductor gets rusted. Due to that, the lines trips or goes on permanent fault many a times. In the coastal area insulator hardware, socket clevis also gets rusted and occurrences are observed where line goes on permanent fault due to mechanical (Hardware) failure. Such lines as well as lines passing through chemical zone required to be strengthened by stub strengthening, replacements of conductor, hardware, insulators, earthwire etc.

The activities which are to be carried out in next 5 year plan, to replace equipments, strengthening of lines, procurement of testing equipments, modernization of sub-stations, augmentation of substation capacity looking to the future load growth, replacement of aged transformers, to scrap very old transformers, replacement of old PILC cable is covered under **S**ystem **I**mprovement **S**cheme (SIS).

System Improvement Scheme (SIS):

The existing assets of GETCO are managed by the Operation & maintenance department under SIS scheme and divided into two main categories.



Renovation & Modernization Policy

Activities considered under R & M policy are as follows:

Sub Stations

1. Replacement of equipments of al voltage class.
2. Replacement of aged transformers.
3. Providing of 66 KV Breakers at receiving end & allied equipment.
4. Replacement of S & S make 11 KV SF6 Breakers.
5. Replacement of 11 / 22 KV old PILC cable.
6. Augmentation of sub station capacity
7. Cross Boundary Protection.
8. Procurement of Fire fighting equipments
9. Improvement of Earthing system
10. Relay and Protection.
11. Procurement of Testing equipments

Transmission Lines

1. Link lines
2. R&M of lines.(Replacement of Conductor & line materials with strengthening of structure

Civil Maintenance

1. Civil Maintenance (General)
2. Tower Footing Protection

Sub Stations

1. Replacement of obsolete & over aged Equipments

In many substations equipments namely breakers, CTs, PTs, LAs, isolators, battery, battery chargers are very old i.e. completed their normal service life. Obsolete design, non availability of critical spares are also factors leading to necessity for replacement of various equipments.

1) Breakers:

The population of the breakers.

Sr No	Voltage Class	Nos.
1	400 KV	62
2	220 KV	536
3	132 KV	412
4	66 KV	3589
5	11 KV	9878

Problems with Breakers:

(1) 400 /220/132 / 66 KV Air Blast Circuit Breakers are very old, having low rupturing Capacity, gas leakage problem, obsolete design etc.

(2) The production of 132 KV TMG (Voltas) make breakers is closed down, spares are not available.

(3) 400 /220/132 KV M/s. ABB is supplying the gaskets & spares for ABCBs. But they have also shown inability to continue to supply of spares / gaskets after some time.

(4) BHEL/HEL make 66 KV BOCB /MOCB are of obsolete design, spares are not available & BOCBs are having in built CTs.

(5) The failure rate of 66 KV Alind make poles is very high, spares and services are not available.

(6) 11KV BHEL make BOCBs, Jyoti make MOCBs are very old, obsolete design and spares are not easily available.

(7) Frequent oil replacement in BOCB / MOCB & having low rupturing capacity.

(8) SF6 gas of 11 KV breakers is hazardous to health due to leakage problem, obsolete design & not performing well.

The following policy will be adopted for the replacement of obsolete technology and aged equipments:

I. The Air Blast Circuit Breakers (ABCB's):

They are very old, low rupturing capacity, air leakage problem, obsolete design etc.

Sr. No.	Make	Type	400 KV	220 KV	132 KV	66 KV
(i)	ABB	DLF	As per ABB Spares (gaskets) will be available for 5 years, to be overhauled through M/s. ABB and to be replaced thereafter. The Breakers to be replaced in those S/S where fault level is high like 220 KV Vapi, Haladarva, Ranasan, Mehsana, Navsari, Vav etc.			
		DCVAF	Spares are not available, rupturing capacity is low, air leakage problem & hence to be replaced.			
		DCAF				
		DCF				
Qty. required to be replaced in Nos.			**0**	**06**	**29**	**9**
Already Approved under One to One Scheme (DLF)			**0**	**13**	**16**	**0**
(ii)	TMG		Breakers are obsolete design. Spares are not available. Hence, proposed to be replaced.			
Qty. required to be replaced in Nos.			**0**	**0**	**13 (4 + 9)**	**0**

II. SF6 Circuit Breakers:

Sr. No.	Make	400 KV	220 KV	132 KV	66 KV
(i)	CGL	SF6 technology came in to existence 20 years back and remain state of art technology for circuit breakers. Manufacturers are recommending overhauling of CBs after 10 yrs. The Bkrs. which have completed service life for more than 10 to 12 yrs. are proposed to be overhauled through respective OEM.			
(ii)	Siemens				
(iii)	ABB				
(iv)	Areva (GEC)				
(v)	BHEL			3AR1EG type (Hyd-mechanism) to be replaced as leakage of oil is noticed, spares not available.	
3ARS type is proposed to be replaced				**25 Nos.**	**07 Nos.**
Already Approved under One to One				**06 Nos.**	**0 Nos.**

III 66KV Bulk Oil Circuit Breakers (BOCB) and 66KV Minimum Oil Circuit Breakers (MOCB):

Sr. No.	Make	Type	Qty. in 1 to 1	Qty in Nos.	Remarks
(i)	BHEL	BOCB	**51**	**112**	Obsolete design, Breakers are with in built CTs, Spares are not available. Hence proposed to be replaced.
		MOCB	**23**	**796**	M/s. BHEL is supplying the spares. But, Breakers given service for more than 15yrs, (Comm. Before 1992) proposed to be replaced.
(ii)	Alind	MOCB	**2**	**263**	Very old and are in service for more than 15yrs (Comm. Before 1992). Spares are not easily available. Hence, proposed to be replaced.

(IV) 11 KV Circuit Breakers (BOCB) and (MOCB):

(A) BOCB:

Make	BHEL	CGL	Kirlosker	Alind
Policy Review	Obsolete design, spares are not available & hence to be replaced	Obsolete design, spares are not available & hence to be replaced	Obsolete design, spares are not available & hence to be replaced	Obsolete design, spares are not available & hence to be replaced

(B) BOCB:

Make	ABB/HBB	Jyoti	NGEF/ASEA
Policy Review	Obsolete design, spares are not available & hence to be replaced.	(i) Type- OZ2H Loss & very old Bkrs more than 20 yrs in service. Low KA/MVA capacity. Hence to be replaced. (ii) Type- MT2 to be replaced which is Comm. Before 1992.	Obsolete design, spares are not available. Hence to be replaced.
Qty. of 11 KV BOCB + MOCB required to be replaced – 1465 Nos.			

(C) SF6 Circuit Breakers:

Make	S & S	Voltas
Policy Review	Firm is closed now and CBs are not performing satisfactorily, spares are not available hence proposed to be replaced.	Firm is closed now. Spares are not available hence proposed to be replaced.
Qty. required to be replaced in Nos.	**S& S Make - 197 Nos.** **Voltas Make - 144 Nos.** **Other Make - 034 Nos.**	
	Total - 375 Nos.	

(D) Vacuum Circuit Breakers :

Make	Jyoti	CGL	Siemens	Areva (GEC)	Bieco lawrie
Policy Review	O.K.	O.K.	O.K.	Mechanism is required to be modified in HG-12 type breaker.	O.K. Mechanical problems observed needs review over time.
Qty. required to be replaced in Nos.	**0**	**0**	**0**	**0**	**0**

Make	Electrotech	Stelmech	A/Yulle	S & S	MEI
Policy Review	O.K.	O.K.	Spares are not available, service after sales is poor. Matter to be taken up with the firm for spares & services.	Firm is ready to supply spares.	O.K
Qty. to be replaced in Nos.	**0**	**0**	**0**	**0**	**0**

Estimated Cost:

Sr. No.	Voltage Class	Quantity	Unit Rate Rs. Lacs	Amount Rs. Lacs
1	220KV	6 + 13 = 19	18.68	354.92
2	132KV	45+13+31=89	8.05	716.45
3	66KV	09+07+819+163+265=1263	6.00	7578.00
4	11KV	1465+197+144+034=1840	3.00	5520.00
			TOTAL	**14169.37**

2) Current Transformer (400/220/132/66 KV):

Population of Current Transformers:

Sr No	Voltage Class	Nos.
1	400 KV	195
2	220 KV	1866
3	132 KV	1332
4	66 KV	10548

Problems with Current Transformers:

(1) Three core 220 CTs are very old having low IR value and low short circuit capacity compared to increased s/s fault level.

(2) Three core 132 CTs are very old having low IR value and low short circuit capacity compared to increased s/s fault level.

(3) 66KV CTs are of three types, viz. live tank, dead tank without bellow and dead tank with steel bellow. The rate of failure of CTs with live tank and dead tank without steel bellow is high during summer, due to temperature variation. The failure is violent i.e. when it blasts, damages to nearby equipments.

The following policy is adopted for the replacement of obsolete technology and aged Current Transformers:

Sr. No.	Voltage Class	Remarks
(i)	220KV	1] ABB CTs with rubber bellow will be modified by steel bellow. 2] 3-core CTs to be replaced by 5-core CTs . 3] CTs having service span for more than 20 yrs and obsolete technology are proposed to be replaced. 4] Short circuit fault level has changed (Make : ABB/HBB, BHEL, TELK, Hivoltrans) **Qty. to be replaced comm. before yr. 1990 - 837 Nos.**
(ii)	132KV	1) CTs having service span for more than 20 yrs and obsolete design are proposed to be replaced. 2) CTs with low STC ratings to be replaced by higher STC rating considering fault level of sub station. (Make : ABB/HBB, BHEL, TELK, Hivoltrans, AEP) **Qty. to be replaced comm. before yr. 1990 - 685 Nos.**
(iii)	66KV	Type of CTs are in service : (A) Live tank (B) Dead tank (C) Dead tank with steel bellow. 1) Live Tank CTs are very old, low STC rating , Failure rate is high and hence to be replaced . 2) Possibility to be find out to provide steel bellow in the Dead tank type CTs without bellow. **ITC, AEP, Andhra Elect& mech, Alind, BHEL, TELK)–3939 Nos**

EstimatedCost:

Sr. No.	Voltage Class	Quantity	Unit Rate in Rs. (Lacs)	Amount in Rs. (Lacs)
1	220KV	837	4.00	3348.00
2	132KV	685	1.75	1198.75
3	66KV	3939	0.45	1772.55
			TOTAL	**6319.30**

3) Potential Transformer (400/220/132/66 KV):

Sr No	Voltage Class	Nos.
1	400 KV	108
2	220 KV	492
3	132 KV	273
4	66 KV	2874

Problems with Potential Transformers:

(1) PTs are normally failing due to oil leakage & low IR value & aging effect.

(2) Very old PTs with single core are now of obsolete design.

The following policy will be adopted for the replacement of obsolete technology and aged Potential Transformers:

Sr. No.	Voltage Class	Remarks
(i)	220KV	PTs having more than 25 yrs service are to be replaced. (Make: ABB/HBB, BHEL, TELK, Hivoltrans,) **Qty. to be replaced comm. before yr. 1982 - 79 Nos.**
(ii)	132KV	PTs having more than 25 yrs service are to be replaced. (Make : ABB/HBB, BHEL, TELK, Hivoltrans, AEP) **Qty. to be replaced comm. before yr. 1982- 75 Nos.**
(iii)	66KV	PTs having more than 25 yrs service are to be replaced. (Make : ITC, AEP, Andhra Elect & mech, Alind, BHEL TELK) **Qty. to be replaced comm. before yr. 1982- 366 Nos.**

Estimated Cost:

Sr. No.	Voltage Class	Quantity	Unit Rate in Rs. (Lacs)	Amount in Rs. (Lacs)
1	220KV	79	3.46	273.34
2	132KV	75	1.75	131.25
3	66KV	366	0.45	164.70
			TOTAL	**569.29**

4) Lightning Arrestors:

Population of Lightning Arrestor.

Sr. No.	Voltage Class	Nos.
1	400 KV	128
2	220 KV	1689
3	132 KV	1266
4	66 KV	6404

Lightning Arrestor plays a very vital role in improving power system reliability by diverting surge to earth and thus protecting costly switchyard equipments. In most of old sub stations gapped type LA's are in service which are of outdated technology.

All utilities are in process of replacing gapped type Lighting Arrestor for their sub stations. The production of gapped type Lighting Arrestors is stopped worldwide after mid-80's and gapless Lighting Arrestors are being used because of better performance.

The following policy will be adopted for the replacement of obsolete technology and aged Lightening Arrestors commissioned before year 1992.

Estimated Cost & Quantity required to be replaced:

Sr. No.	Voltage Class	Quantity	Unit Rate in Rs. (Lacs)	Amount in Rs. (Lacs)
1	220KV	795	0.50	397.50
2	132KV	665	0.33	219.45
3	66KV	2991	0.15	448.65
			TOTAL	**1065.60**

(5) Battery:

Population of Battery Sets:

Sr. No.	Battery Capacity	Nos. of Sets
1	110 V, 100 AH	757
2	110 V, 250 AH	69
3	220 V, 250 AH	30
4	48V, 350 AH	237

GETCO is having 836 Nos. of Sub-stations out of these 540 Nos. of Sub-station are more than 10 Years old. The battery is heart of the Sub-station. It is necessary that battery should be in good & working condition at all the time. The service life of battery Set is 9 to 10 Years. After it or even before that the battery gets deteriorated. Hence it is required to be replaced.

Estimated Cost & Quantity required to be replaced Commissioned before year 1999 :

Sr. No.	Capacity	Quantity	Unit Rate in Rs. (Lacs)	Amount in Rs. (Lacs)
1	110V, 100AH	430	0.80	344.00
2	110V/220, 250AH	69	1.50	103.50
			TOTAL	**447.50**

(6) Battery chargers:

Population of Battery Charger:

Sr. No.	Capacity	Quantity in Nos.
1	20 A.	766
2	50 A.	152
3	PLCC Charger	237

GETCO is having 836 Nos. of Sub-stations out of these 168 Nos. of Sub-station are more than 25 Years old. In these Stations battery chargers are very old and of obsolete design, spares are not available, many a times not working on both float / Boost mode. It is also necessary to replace such battery chargers in phased manner.

Estimated Cost & Quantity required to be replaced commissioned before year 1985:

Sr. No.	Capacity	Quantity	Unit Rate in Rs. (Lacs)	Amount in Rs. (Lacs)
1	Single Phase, 20Amp.	173	0.62	107.26
2	Three Phase, 50 Amp.	38	1.00	38.00
			TOTAL	**145.26**

Summary of equipments to be replaced during 11th Five year plan :

Sr. No.	ITEM	Unit	Qty.	Unit Rate in Rs.	Grand Total
	Breakers				
1	220 KV Breaker ABCB	Nos.	19	18.68	354.92
2	132 KV Breaker ABCB	Nos.	45	8.05	362.25
3	132 KV SF6 3ARS	Nos.	31	8.05	249.55
4	132 KV TMG Bkr	Nos.	13	8.05	104.65
5	66 KV MOCB (BHEL)	Nos.	819	6.00	4914.00
6	66 KV MOCB (ALIND)	Nos.	265	6.00	1590.00
7	66 KV BOCB (BHEL)	Nos.	163	6.00	978.00
8	66 KV SF6 3ARS	Nos.	7	6.00	42.00
7	66 KV DCF (ABB)	Nos.	9	6.00	54.00
8	11 KV SF6 (Volats)	Nos.	144	3.00	432.00
9	11 KV MOCB / BOCB	Nos.	1465	3.00	4395.00
10	11 KV SF6 W/O Voltas	Nos.	34	3.00	102.00
	CTs.		0		0.00
1	220 KV CT	Nos.	837	4.00	3348.00
2	132 KV CT	Nos.	685	1.75	1198.75
3	66 KV CT	Nos.	3939	0.45	1772.55
	PTs.		0		0.00
1	220 KV PTS	Nos.	79	3.46	273.34
2	132 KV PTS	Nos.	75	1.75	131.25
3	66 KV PTS	Nos.	366	0.45	164.70
	LAs.		0		0.00
1	220 KV	Nos.	795	0.50	397.50
2	132 KV	Nos.	665	0.33	219.45
3	66 KV	Nos.	2991	0.15	448.65
	Bettery Sets.		0		0.00
1	110V, 100AH	Nos.	430	0.80	344.00
2	220V / 110V, 250AH	Nos.	69	1.50	103.50
	Bettery Charger.		0		0.00
1	Single phase, 20 AMPS.	Nos.	173	0.62	107.26
2	Three phase, 50 AMPS.	Nos.	38	1.00	38.00
				Total Rs. in lacs	**22125.32**

Estimated Cost for replacement of equipments is Rs. 22125.00 Lacs.

Note: All replacement is proposed under buy back scheme.

2. Replacement of aged transformers:

In GETCO system the total population of transformers is 1949 Nos. Out of these, many transformers are very old i.e. completed the service life of more than 30 years. For these transformers either to carry out re insulation of windings or to replace by new transformer. The re insulation of winding in EHV class transformer is not possible, in case of Interleaved winding as there will be nos. of joints. The core of the transformer might be non CRGO. Hence the no load losses will be more. It is there fore proposed to replace transformers having completed 30years of service life.

The following policy will be adopted for the replacement of aged Power Transformers:

To replace the transformers having completed service life of **30 years:**

Abstract: (Having life > 30 yrs.)

Sr. No	Volt. Class	Capacity in MVA										Total
		150	100	50	40/30	25	20	12.5	15	10	7.5	4/3/2	
1	220/132	3	6	1									10
2	220/66			2		1							3
3	132/66			6	19		18						43
4	132/33			2			2						4
5	132/11							1					1
6	66/33									1	1		2
7	66/22								2	8	7		17
8	66/11								21	84	88	7	200
Total		**3**	**6**	**11**	**19**	**1**	**20**	**1**	**23**	**93**	**96**	**7**	**280**

Estimated Cost:

Sr.No.	Voltage Class KV	Capacity in MVA	Quantity	Unit rate in Rs. (Lacs)	Amount in Rs. (Lacs)
1	220/132	150	3	550	1650
		100	6	450	2700
		50	1	300	300
2	220/66	50	2	300	600
		25	1	300	300
3	132/66	50	6	200	1200
		40	19	200	3800
		20	18	200	3600
4	132/33	50	2	200	400

		20	2	200	400
5	132/11	12.5	1	150	150
6	66/33	10/7.5	2	100	200
7	66/22	15	2	100	200
		10/7.5	15	80	1200
8	66/11	15	21	100	2100
		10/7.5/5	172	80	13760
				TOTAL	**32560**

3. Providing 66 KV Breakers with allied equipments at receiving end of sub stations:

Initially on few transmission lines where breakers & CT's were not provided at receiving end at the time of commissioning. To prevent transformer and other equipments failure due to reflected fault of 66 KV transmission line & to avoid power interruption it is necessary to provide circuit breakers and allied equipments for protection & metering at receiving end of sub stations.

- Proposed to provide circuit breakers and allied equipments in phased manner in 325 Nos. of locations.

Estimated Cost:

Sr. No.	Name of equipment	Quantity	Unit Rate in Rs. (Lacs)	Amount In Rs. (Lacs)
1	Breaker	325	6.00	1950.00
2	C. Ts	975	1.35	1316.25
3	C & R panel	325	1.00	325.00
4	Structure, cable etc.	LS	0.20	65.00
			TOTAL	**3656.25**

4. Replacement of 11 KV S & S make SF6 Breakers

The S & S make SF6 circuit breakers are of obsolete design, factory has been locked out, spares are not available, the breakers are giving frequent troubles and at many substations accident took place hence needs replacement.

- Proposed to Replace new technology circuit breakers in place of S & S make SF6 breakers. (i.e 38 Nos. incomers, 140 Nos. feeders & 19 Nos. Capacitor Banks.)

Estimated Cost:

Sr. No.	11KV Breakers	Quantity	Unit Rate Rs. Lacs	Amount in Rs. Lacs
1	Incomers	38	3.57	135.66
2	Feeder	140	2.70	378.00
3	Capacitor Bank	19	4.50	85.50
TOTAL				**599.16**

5. REPLACEMENT OF 11 / 22 KV OLD PILC CABLE:

In existing network of GETCO, PILC Power cables were utilized for 11 & 22 KV side of transformers and in out going feeders. These cables are very old and found deteriorated and having weak insulation. Due to aging effect and weak insulation, these cables are fired / flash over during monsoon period & reflected fault of 11 / 22 KV feeders. Due to cable failure, incedences of power transformers / breaker failures are noticed. Such incidences create zero power to that feeder or in some cases in entire sub station.

- Proposed to replace 11 / 22 KV PILC cables by XLPE cables to avoide failures of transformere & 11 / 22 KV breakers in the s/s & to provide uninterrupted power supply to consumers.

Requirement of 11 /22 KV XLPE Cables for various TR Circles:

Sr. No.	Name of Circle	Unit	Qty. / Size of Cable. (XLPE) MM²	
			185	240
1	Navsari (11 KV)	Kms.	4.0	1.2
2	Bharuch (11 KV)	Kms.	2.0	0.5
	Bharuch (22 KV)	Kms.	0.5	0.0
3	Jambuva (11 KV)	Kms.	10.0	3.1
4	Nadiad (11 KV)	Kms.	5.0	1.8
	Nadiad (22 KV)	Kms.	1.0	0.5
5	Mehsana (11 KV)	Kms.	3.0	1.5
6	Palanpur (11 KV)	Kms.	3.0	1.4
7	Gondal (11 KV)	Kms.	6.5	1.0
8	Amreli (11 KV)	Kms.	3.0	0.7
9	Anjar (11 KV)	Kms.	0.5	0.1
10	Junagadh (11 KV)	Kms.	2.5	1.8
Total of 11 KV Cable			39.5	13.1

Total of 22 KV Cable	1.5	0.5
Unit Rate 11 KV Rs. In Lacs	13.00	15.00
Unit Rate 22 KV Rs. in Lacs	14.00	16.50
Amount of 11 KV Rs. In lacs	**513.50**	**196.50**
Amount of 22 KV Rs. In lacs	**21.00**	**8.25**
Total Amount Rs. In lacs	**534.50**	**204.75**
Grand Total Rs. In lacs		**739.25**

6. Augmentation of Sub station Capacity

Gujarat is a developing State. The industrial / commercial load demand is increasing day by day. Therefore it is essential to increase the capacity of existing sub-station by adding the new transformers or augmenting the existing transformers capacity by higher capacity transformers. This requires 220/132/66KV class transformers with associated equipments. This will help to cop-up the demand of new as well as existing consumers with better reliability.

- Proposed augmentation with higher capacity power transformer to cope up with load growth.
- Proposed 2nd power transformer with allied equipments at sub stations having only one power transformer to avoid zero power situation at 158 Nos. of sub station.

Estimated Cost:

Sr. No.	Item	Quantity	Unit Rate Rs. Lacs	Amount Rs. Lacs
1	66/11KV, 10MVA, Transformer	158	85.00	13430.00
2	Bay equipments like breaker, CTs, C&R panel, isolator, 11KV incomer, control cables, civil work	158	15.00	2370.00
TOTAL				**15800.00**

SUB-STATIONS APPROVED FOR AUGMENTATION :

Estimated Cost:

Sr. No.	Capacity in MVA	Net Quantity	Unit rate Rs. lacs	Amount in Rs. Lacs
1	10	14	70.00	980.00
2	15	31	100.00	3100.00
Associated equipments for above Rs in lacs				**145.00**
Total				**4225.00**

7. Cross Boundary Protection

At present there is no cross boundary protection between GETCO and DISCOMs. It is noticed that while working on the DP of feeder power cable and overhead 11/22KV line junction, the accident occurred to the employee due to back feeding of power from consumer network of the DISCOMs. Hence it is necessary to provide 11/22KV AB switch between existing DP of s/s and first location of feeder.

- Proposed to provide A.B. switch between Existing S/S DP & first location of 11 / 22 KV feeders during 2007-08 & 2008-09. (i.e. 7292 Nos. on 11 KV feeders & 250 Nos. on 22 KV feeders.)

Estimated Cost:

Sr. No.	Description	No. of Feeder	Unit Rate Rs. Lacs	Amount Rs. Lacs
1	11 KV feeders	7292 Nos	0.2825	2059.99
2	22 KV feeders	250 Nos.	0.3840	96.00
			TOTAL	**2155.99**

Say Rs. 2156.00 lacs

8. Fire fighting equipments

At many substations fire fighting equipments & systems are yet to be provided and some of existing fire fighting equipments systems are require to be attended for making them operational.

- Proposed to provide new fighting equipments / systems are to be provided as per shortfall.
- Proposed to provide fire fighting equipments in sub station where it is not available/not in working condition.

Sr. No.	Description of fire fighting equipment	Qty. of 220/132 /66 KV	Qty. of 400 KV	Total Nos.
1	DRY CHEMICAL POWDER 25 KG	211	58	269
2	DRY CHEMICAL POWDER 10 KG	1171	0	1171
3	DRY CHEMICAL POWDER 5KG	12	14	26
4	CO2 TYPE 22.5KG	1117	79	1196
5	CO2 TYPE 6.5KG	1339	110	1449
6	MECHANICAL FOAM TYPE 50 LTRS.	768	34	802

Estimated Cost:

Sr. No.	Name of fire fighting equipment	Unit Rate in Rs.	Qty	Amount in Rs.
1	DRY CHEMICAL POWDER 25 KG	19125.00	269	5144625.00
2	DRY CHEMICAL POWDER 10 KG	3150.00	1171	3688650.00
3	DRY CHEMICAL POWDER 5KG	2250.00	26	58500.00
4	CO2 TYPE 22.5KG	15750.00	1196	18837000.00
5	CO2 TYPE 6.5KG	6750.00	1449	9780750.00
6	MECHANICAL FOAM TYPE 50 LTR.	31284.00	802	25089768.00
		Grand Total Rs.		**62599293.00**

Say Rs.626.00 lacs

9. Improvement of earthing system:

With increase in loading n sub stations vis-à-vis evacuation of more power from Generating stations, the short circuit level at some sub stations have increased compared to that at the time of commissioning of the sub stations. Simultaneously the aging of earthing system components such as pipe electrode / GI Strips / CI plates over a span of 25-30 years have resulted in erosion and deterioration of earthing components. This situation warrants strengthening of earthing system for the diversion of the ground fault current for protecting precious equipments from likely damages and to avoide serious situation like floating neutral.

Proposed to strengthen earthing system at sub stations where existing earthing system have undergone severe deterioration & fault level is approaching the critical limit.

Estimated Cost for provision of Earthing for 220KV/132KV Sub stations: Rs. 2150.00 Lacs.

10. Relay and Protection:

Looking to the present scenario & development of latest technology for protection of equipments and lines it is pertinent to replace relays having old & obsolete technology by modern technology numerical relays having distinct feature & reliable operation over a period of time for betterment of system.

Also now a days fault study & analysis has greater significance. For fault analysis fault data is necessary, which can be possible only with numerical relays, which has inbuilt disturbance recorder that provides pre fault & post fault data.

1. Distance protection relays: Type MM3V/SSRR3V:

These relays are almost 20 to 30 years old and are electromagnetic type. This is a very old & obsolete technology. The frequent failure of coils and other components render the relay fully or partially inoperative and owing to lack of self-supervision feature the problem in the relay cannot be detected before damage is done.

- Proposed to replace with modern technology numerical relays, which have no. of additional features including fault locator and disturbance recorders.

2. Differential relays: EE and UE make type - DDT & ITD:

Existing differential relays are old and obsolete with electromagnetic technology & does not have second harmonic restraint feature which is very important to restrain unwarranted tripping of transformers during energisation.

- Proposed to replace with modern technology numerical relays.

3. O/C, E/F relays: Jyoti make - Type JTRSA:

These relays are also very old and not performing satisfactory. The population of such relays is over 1250 nos. However we have considered replacement of relays, which are more then 15 years old. These relays are to be replaced mainly in 66KV substations on 66&11KV voltage class feeders and transformers.

- Proposed to replace with modern technology numerical relays.

Sr no	Description of proposal	Quantity
1	Replacement of UE make Dir. / N.D. O/C & E/F relays by numerical relays	Directional - 31 Non directional - 881 Total - 912
2	Purchase of AUFLS for S/S where JGY load in more than 3 MW	50 Nos Phase-I
3	Purchase of Numerical DPS relays for retrofitting of Old MM3V scheme	32 Nos
4	Purchase of busbar protection panels for various s/s.	Numerical - 22 Static - 2
5	Purchase of Tan Delta & capacitance kit	3 Nos
6	Retrofitting of main-2 protection for 400KV lines	14 Nos
7	Replacement of old relays. (Uniform policy Phase - I)	Distance - 159 Differentail - 343 Non dir. O/C-E/F - 474

8	Replacement of old relays. (Uniform policy Phase - II)	Differential - 322 Directional O/C-E/F - 226 Non-Dir. O/C-E/F -1300
9	Replacement of old relays. (Uniform policy Phase - III)	Distance - 6 Differentail - 353 Directional O/C-E/F - 157 Non dir. O/C-E/F - 919
10	Replacement of old relays. (Uniform policy Phase - IV)	Directional O/C-E/F - 664 Non dir. O/C-E/F - 825
11	Replacement of old relays. (Uniform policy Phase - V)	Distance - 15 Differentail - 145 Directional O/C-E/F - 1 Non dir. O/C-E/F - 1291

Estimated Cost: Rs. 4420.00 Lacs.

11. Testing equipments:

Purchase of modern testing equipment for various sub stations are required to check & know the healthiness of each equipments and their electrical and mechanical parameters for better operation and maintenance of the sub stations and transmission lines, which includes computers for remote monitoring, safety tools, modern tools and tackles, testing equipments etc.

At present testing equipments available with SMS / Testing are very old and requires new technology testing equipments. Following equipments are proposed to provid.

- Impedance meter.
- Circuit breaker analyzer.
- Winding resistance meter.
- Relay testing kits.
- Thermo vision camera.
- SF6 gas detector kit.
- Static resistance measurement kit for breaker & isolator.
- SF 6 gas analyzer (Dew point measurement)
- LEM (leakage current monitoring) kit for LA.
- On line DC earth fault locator.
- Sweep frequency response analyzer.
- Turns ratio meter.
- Knee point test kit.
- Tan Delta Testing Kit.
- HV Test Kit for Vaccumme breakers.
- Insulation tester with electro static suppression for all 400KV S/s.

- Proposed to equip the SMS & testing squad with modern technology testing equipments.

Estimated Cost for procurement of Testing Equipment is Rs. 1769 Lacs.

Transmission Lines:

1. Link Lines

In existing network where more than two sub stations connected on single source, the line is overloaded. Also when a sub station is connected through one source of supply, it is prone to zero power condition. In both such conditions additional is required to reduce the over load and to avoid zero power condition respectively.

- Proposed to erect link lines for existing overloaded lines and for sub station having single source. (224 Nos.)

Estimated Cost for erection of link lines is Rs. 27898 Lacs.

2. Strengthening of lines:

(1) Mechanical Strengthening:

The transmission lines which were in service for more than 25 years and situated on coastal areas, creek area, chemical zone etc. are affected due to saline atmosphere and aging. The towers / H-frames of such line are badly affected due to corrosion and chemical reaction. Hence it is required to strengthen the same by providing new members in towers / H-frames, strengthening of stubs & foundation, Earthing, stays, Painting, etc.

(2) **Replacement of Conductor & line materials**

Corrosion takes place due to oxidation on conductor, Insulator, Hardware, earth wire etc. on transmission lines passing through coastal area, creek area & chemical zone. Due to corrosion and aging occurrence of insulator failure, tripping & snapping of conductor takes place which interrupt the power supply. To enhance the life of transmission lines it is require to be strengthened by replacement of insulator, conductor, H/W etc.

(3) Enhancement of line capacity

The Transmission lines are nerves of power flow from Generation station to the end consumers. The Transmission line loading is function of standard capacity of particular size of conductor. Augmentation of line capacity shall therefore be required to meet increased demand of power. In case of exigency, to cater to the demand of power, Augmentation of line capacity shall be required for a safe Transmission system.

- ❖ Proposed to strengthen lines by mechanical strengthening, replacement of accessories & enhance the capacity of lines wherever required.

Estimated cost for strengthening of lines is Rs. 4050.00 Lacs.

Replacement of Only Insulators :

Estimated cost for Replacement of insulatore is Rs. 1386.00 Lacs.

Civil Maintenance

1. Maintenance of s/s, office building & colony:

Purchase of new office furniture, computers and peripherals for modernization and up-gradation of offices, which results in facilitates to office works through fast communication via WAN and Internet. Providing of mobile facilities to Engineers for fast and speedy communication in daily routine work. Modernization of office building improves the efficiency of employees.

R & M OF CIVIL WORKS INCLUDES:

- Control room buildings.
- Staff quarters.
- Office / store buildings.
- Roads of colony and s/s.
- Compound wall / fencing, etc.
- Sub station equipment foundations.
- Raising the hight of 220 KV and 66 KV substations which are frequently affected due to heavy flood, natural calamities and heavy deterioration / aging on top priority

R & M OF CIVIL WORKS IS A NEED OF TIME FOR:

- Extending the life of structures
- Improving the serviceability of the structures
- Better house-keeping.